

ABSTRACT

A method is provided for close control and adjustment of in-cylinder oxygen concentration levels together with boost adjustments to minimize harmful emissions during transients in engines which utilize late direct cylinder injection of fuel. EGR flow rates are adjusted in a closed loop, linked fashion together with boost pressure changes during transients, to maintain intake charge-air oxygen concentration and boost levels within critical ranges for controlled temperature, low emission combustion. Changes in fuel feed into the cylinder are made to wait for or follow changes in the boost level of charge-air into the cylinder for combustion. Temporary fuel levels are not allowed to exceed desired fuel/oxygen ratios during transients, by controlling fuel feed responsive to the level of boost of charge-air being taken into the cylinder for combustion.

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The present invention provides a A method is provided for close control and adjustment of in-cylinder oxygen concentration levels together with boost adjustments in such a way as to minimize harmful emissions during transients in engines which utilize late direct cylinder injection of fuel. In this invention, EGR flow rates are adjusted by means of an EGR control valve in a closed loop, linked fashion together with boost pressure changes during transients, to maintain intake charge-air oxygen concentration and boost levels within critical ranges for controlled temperature, low emission combustion. Furthermore, in order to minimize harmful emissions during rapid transient changes in operating conditions, Changes in fuel feed into the cylinder are made to wait for or follow changes in the boost level of charge-air into the cylinder for combustion. This addresses a problem in diesel engines, during acceleration, of having temporary fuel levels in excess of desired fuel/oxygen ratios during transients, with the result of increased PM levels from insufficient oxygen for rapid, complete combustion. In this invention, Temporary fuel levels do not are not allowed to exceed desired fuel/oxygen ratios during transients, by means of controlling fuel feed responsive to the level of boost of charge-air being taken into the cylinder for combustion.